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ABSTRACT

Steps in a class action suit charging prejudicial treatment of a minority group by a college or university are summarized, and attention is directed to how the plaintiffs can use the institution's own data to establish a prima facie case for disparate treatment. The key legal issues are indicated, and typical data and statistical exhibits that an institution might expect to see filed against them by the plaintiffs are displayed. Emphasis is placed on the role institutional researchers play in the defense phase, particularly with regard to strategies for defending against a multivariant regression model that the claimant's statistical expert has submitted in evidence of a classwide bias. The overall class of women faculty members is used as an example of a class action suit. After certification of the class, which may take two or three years, the exact nature of the alleged discrimination against specific individuals is investigated. The length of the second phase is largely dependent upon the number of class members who come forward with claims of discriminatory injury. One type of claim, called the disparate impact doctrine, asserts that the selection process used for determining salaries and promotions had had a substantial disproportionate and unfavorable impact on the class. The second type of claim, called the disparate treatment doctrine, asserts that the selection procedure is intentionally discriminatory. The literature of courtroom use of regression models suggests that both sides need to produce explanatory models. In some cases a prehearing protocol has been developed to specify those data variables that are relevant and important and to ensure that both sides begin with those data. Among the suggestions offered to institutional researchers are to become familiar with regression studies, and to have institutional studies on faculty available for reference. A bibliography is appended. (SW)

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THE ROLE OF THE INSTITUTIONAL RESEARCHER IN A SEX DISCRIMINATION SUIT

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THE ASSOCIATION FOR INSTITUTIONAL RESEARCH

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Mary Corcoran
University of Minnesota
(Editor, AIR Forum Publications)

ABSTRACT

This paper has three purposes, the first being a summary of what transpires when an institution of higher education is the defendant in a class action suit charging prejudicial treatment of some minority group. The second purpose is to demonstrate how easily the plaintiffs can use the institution's own data to establish a prima facie case for disparate treatment. The final goal is to display typical data and statistical exhibits that an institution might expect to see filed against them by the plaintiffs. Considerable attention is placed on discussing the role institutional researchers play in the defense phase, particularly with regards to strategies for defending against a multivarient regression model that the claimants' statistical expert has submitted in evidence of a class-wide bias. The hoped-for result of this exposition would be greater alertness to the vulnerability of any institution and an appreciation of the need for advance preparation that would ensure the availability of data and techniques required to make a strong defense against an unjust class action suit.

THE ROLE OF THE INSTITUTIONAL RESEARCHER IN A SEX DISCRIMINATION SUIT

Introduction

Of all the vexing problems faced by university and college administrators, those involving law suits often prove to be the most unpleasant and physically exhausting. Clearly, prevention is the preferred course, but this is rarely an available option. Most administrators accept the fact that they will at some time have to represent the institution in a legal suit. With this in mind, their responsibility then becomes one of managing the institution's affairs in such a manner as to minimize the number of unjust suits and, when such unreasonable suits do reach the courts, insure that they do not win. Advance preparation is the key to this intent. Many potential problems can be forestalled by alert administrators who are familiar with current federal regulations and how the courts have interpreted them, who have seen to it that adequate affirmative action procedures are in effect and closely monitored, and that everyone has recourse to an internal grievance procedure. Aside from these important precautions--some of which may involve institutional research--there are other preparations that should be attended to, which are more closely associated with the Office of Institutional Research. The primary purpose of this paper is to demonstrate why some advance preparation is necessary; this demonstration is provided within the context of what transpires once a claim reaches the courtroom.

Among the many possible litigations that an institution may find itself entangled, the most common type is one involving some degree of discrimination, and of all the discrimination suits, the most costly is a "class action" suit involving the large class of all women faculty members. Thus, for illustration purposes, this paper will primarily focus upon this type of litigation, although many of the points made are general enough to carry over to other types of

discrimination and to individual as well as class action suits.

The institutional researcher becomes involved in class action suits because the legal arguments are very much based upon data and statistical measures of that data. Courts are sensitive to the role of probability and coincidence in shaping events and are aware of the risks of imposing liability on people for events that were caused by chance. Statistics is an effective tool for measuring such risk (Baldus and Cole, 1980). The purpose of this paper is not, however, to show how a solid legal argument is developed nor to propose the proper way to generate a regression model. Rather, the purpose is to provide the large scale outline of how a class action suit progresses, point out the key legal issues in question, indicate where the institutional researcher fits into the process and what kinds of tasks such an individual may be called upon to perform, and finally, to indicate some useful references and provide some hints for resolving difficulties that commonly occur.

The Legal Process

A class action suit is one which is filed by individuals who claim that they have suffered an injustice or injury which has been systematically inflicted upon an entire class of individuals, of which they are but token representatives. Thus, if we focus our attention on the concrete example involving women faculty members, a typical class action suit would involve a few women, who, feeling that their promotions and salaries have been affected by a general male bias against all women faculty, file a class action suit with the claimed class being all women faculty members.

Clearly, the potential liabilities of a class action suit are staggering in that a claim filed by a few individuals can mushroom into a similar claim for a large class of people. Because a class action is so difficult to defend against, is so costly in both time and lawyers' fees, and harbors the possibility of developing into a huge liability settlement, it represents the most threatening

legal action that can be brought to bear on an institution. In fact, the potential for loss is so weighted against an institution that many will adopt a pragmatic stance and settle with the plaintiffs out of court without regard for the merits of the impending suit. This possibility is, of course, one reason why many plaintiffs lodge class action suits rather than pursuing individual court actions.

The first step in a class action is one of certifying the class involved. The burden of proof initially rests with the plaintiffs to establish a prima facie case for the class being as they contend. In the case before us, the women would seek to show that there is sufficient evidence to support a suspicion that there may well be a pervading prejudice against women faculty members throughout all academic departments. During this phase of the proceedings, the existence of discrimination towards the plaintiffs is not in contention; rather, the hypothesis is this: Given that the plaintiffs have suffered some discriminatory injustice, do the university procedures and administrative style suggest that similar prejudices have been brought to bear on some larger group of women such as all tenure system women or all women in certain colleges? If enough evidence is presented to establish this prima facie case, then the burden of proof shifts to the university to refute this evidence completely, or to present additional data to support the counter claim that the proper class is a smaller unit such as a specific college or even certain departments. After the legal counsels for both sides have presented their cases and had opportunities to examine and cross examine witnesses, the court then certifies the class of individuals to which the suit applies. This ruling could certify any class from that claimed by the plaintiffs down to the smallest recognizable unit containing women. It might also result in the class action being dismissed, in which case the plaintiffs may wish to file their separate claims. The outcome of this stage is most crucial to an institution because the smaller the certified class,

the smaller the potential settlement.

With the certification of the class, a process that may take two or three years, the second stage of the suit begins. In this stage, the exact nature of the alleged discrimination against specific individuals is investigated. In business enterprises, where individuals in a class are very homogeneous in both qualifications and with respect to the nature of their work, the court--after looking over additional evidence--may rule that the entire class was discriminated against and order an across-the-board settlement. However, because faculty members differ so widely in background, market value, and function, it is far more likely that the court will examine each individual's claim on its own merits rather than seeking class-wide evidence. The usual judicial approach recognizes that proof of a policy of discrimination against a class is not sufficient to infer bias in the treatment of any one individual (Baldus and Cole, 1980). Thus, the length of the second phase is largely dependent upon the number of class members who come forward with claims of discriminatory injury. Since in this paper we are concerned with presenting information that can be generalized to all institutions, we shall restrict our attention to the class certification phase--a phase which contains elements common to many different situations and institutions and yet which represents the crux of a class action proceeding. In the next section we examine the details of how the plaintiffs established a prima facie case.

Establishing the Prima Facie Case

There are several types of claims that can be established but two are more commonly found in class action suits against universities. The first, called the Disparate Impact Doctrine, claims that the selection process used for determining salaries and promotions has had a substantial disproportionate and unfavorable impact on the class. Whether or not this selection procedure is intentially biased is not an issue of contention under this type of claim. To establish the

prima facie case, the claimants must show:

(1) that there exists an observable difference in salary and rank levels between members of the class and faculty outside the class;

(2) that this difference is significant in magnitude; and

(3) that this difference could hardly occur by mere chance. (Most plaintiffs would substantiate this by providing a statistical proof of significance. In fact, some courts have required such proof.)

To refute such a disparate impact prima facie claim, the defending institution can take several approaches:

(1) it can show that the selection principles causing the disproportionate impact is a bona fide requirement for the job (e.g., a Ph.D. is required for promotion);

(2) it can show that the discrepancy could have occurred by chance;

(3) it can show that the differential is caused by some other factor not involved in the selection process.

The second type of claim is called the Disparate Treatment Doctrine. Such a theory goes one step further than the impact doctrine by claiming that the selection procedure is intentially discriminatory. To establish this more damning claim, the plaintiffs seek to show that either the institution is using an illegal selection procedure or that it is using a legal but unnecessary criterion because of the disproportionate impact it will have on the class. Both these claims imply discriminatory intent. For purposes of establishing the prima facie case, the requirements of proof are considerably relaxed; under present law, once the plaintiff has demonstrated that the selection process contains a discretionary element and has produced a substantial disporportionate impact on the class, an inference of disparate treatment will generally arise without further

proof being required (Baldus and Cole, 1980). The defense against such a claim is correspondingly more complex in that the element of discriminatory intent must be dealt with. One possible defense would be to show that the disproportionate impact is explained by a legitimate criterion and not by any exercise of discretion.

Since there is rarely any direct evidence of discrimination, a prima facie case is usually based on circumstantial evidence. Regardless of the type of claim--disparate impact or treatment--the first step of establishing the prima facie case is to show that a sizable differential exists between the salaries and ranks of minority class and the rest of the faculty. The evidence needed at this initial stage is minimal and probably exists at nearly every institution of higher education. The two graphs in figure 1 could well serve as typical class action exhibits of disparate impact. To demonstrate that such average differences are beyond the commonly accepted limits of chance, the plaintiff could present the results of a chi square test or analysis of variance. Properly presented, such highly aggregated data--shot through though it is with invalid assumptions--makes a very compelling argument in court.

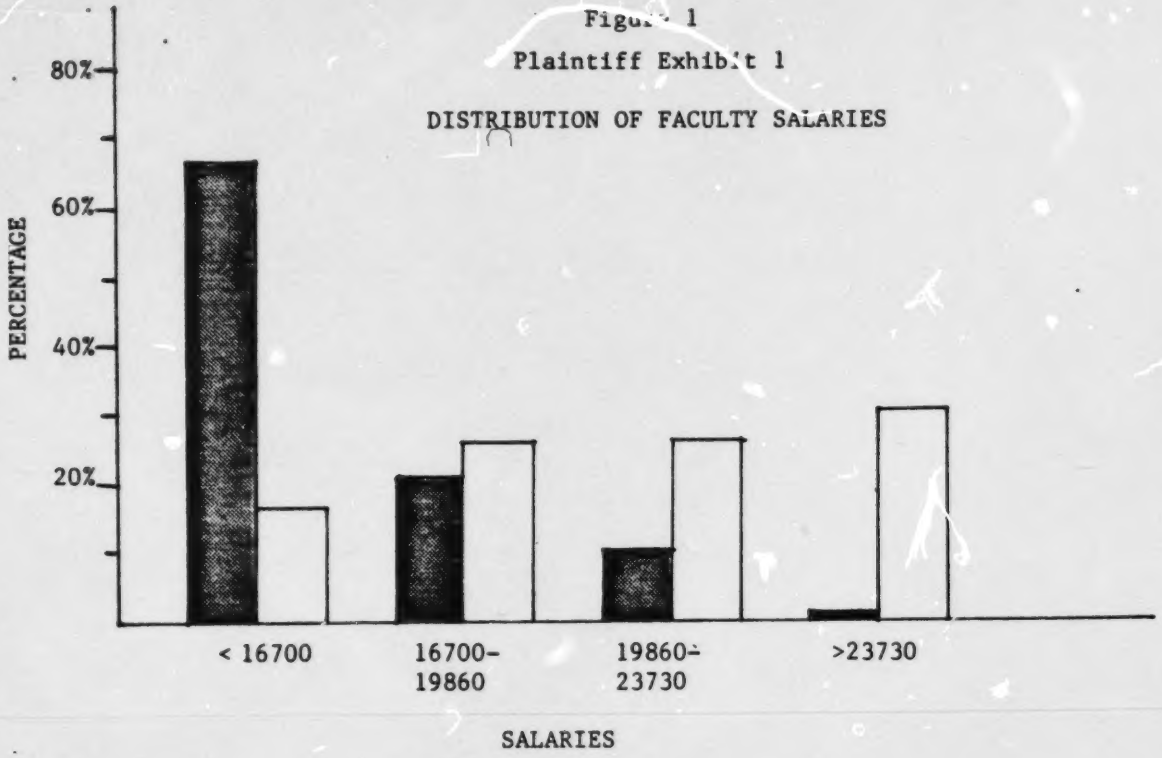
If the plaintiffs have sufficient resources and time to hire a statistician, they can further strengthen their position by developing a regression analysis. In doing so, the plaintiffs go beyond the prima facie requirements and attack the anticipated counter arguments by showing that the exhibited salary inequities can not be attributed to the usual qualifications of terminal degree, time in rank, etc. In so doing, they strip away the defendant's first line of defense and force them to respond in far more detailed arguments and complex models.

After the researcher representing the plaintiffs has obtained the necessary data from the defendants--which they must provide--he or she can take one of several approaches. One such approach would be to use the resulting regression equation to calculate predicted salaries for all faculty members and subtract

Figure 1

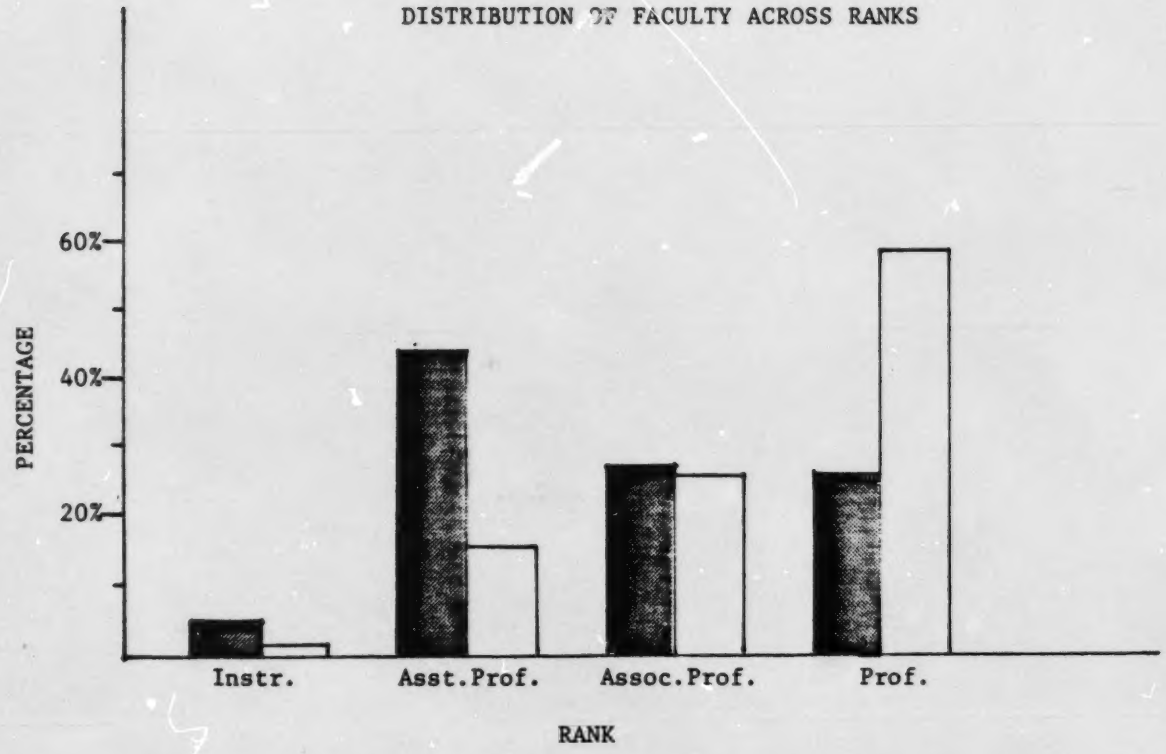
Plaintiff Exhibit 1

DISTRIBUTION OF FACULTY SALARIES



Plaintiff Exhibit 2

DISTRIBUTION OF FACULTY ACROSS RANKS



them from the actual salaries. If, in general, women appear to be more often underpaid than men, a graphical display of these salary residuals will strikingly bring this fact forward as shown in figure 2. In addition, the relatively sophisticated techniques used to obtain these data will place a greater burden on the defendants to effectively counter them.

A second regression approach that is effective is to include "sex" as an independent variable in the regression equation. If an institution's salary decisions are based only on legitimate factors, a person's gender should have no effect on salary. (Statistically this may not be the case but such technical arguments are not effective at this point of the hearing.) If, then, the regression routine shows that "sex" is a statistically significant variable, having the effect of lowering the salaries of women, the plaintiffs can advance the inference that there is a university-wide salary bias against females. Again, properly presented, these statistical results can be very convincing in the courtroom before a lay audience. What is more upsetting is that they are not at all difficult to obtain, even in the absence of any gender discrimination. In situations where the faculty number in the thousands, any carelessly handled regression model will result in nearly every independent variable being statistically significant regardless of how meaningless it might be. A researcher can almost be guaranteed these results if he omits rank as an independent variable. The plaintiffs can easily justify this omission on the basis that promotions and salary biases must surely go hand-in-hand and one should not justify salary injustices by using promotional discrimination.

As the plaintiffs present their exhibits, the counsel for the defense is given the chance to question them. At this point the institutional researcher may be asked to suggest questions to the lawyers as the cross examination progresses; however, inquiries or challenges of a technical nature are usually minimal at this point. If a claim of intentional discrimination is being pursued, the

Figure 2
Plaintiff's Exhibit 3

SAMPLE PLOT OF MALE AND FEMALE SALARY RESIDUALS (ACTUAL SALARY - PREDICTED SALARY)

FOR A SINGLE ACADEMIC DEPARTMENT

	Actual Salary	Predicted Salary	Residual
MALES IN DEPARTMENT A			
1.	$22750	$22447	$ 302
2.	20000	20718	- 718
3.	21690	21734	- 44
4.	19500	18045	1454
5.	17310	17316	- 6
6.	18210	18669	- 459
7.	23733	17938	5794
8.	22000	26913	-4913
9.	14600	14142	457
10.	20840	18606	2233
11.	14750	14899	- 149
12.	24610	25559	- 949
13.	17410	20415	-3005
14.	16000	16708	- 708
15.	26210	22762	3447
16.	17804	19987	-2183
17.	26620	26136	483
18.	22640	21906	733
19.	20220	20308	- 88
20.	15710	19274	-3564
21.	23750	25209	-1459
22.	22450	20097	2352
23.	15850	16408	- 558
24.	17510	16129	1380
25.	17660	18181	- 521
26.	20360	17896	2463
27.	18060	18758	- 698
28.	22750	24086	-1336
29.	18310	16797	1512
FEMALES IN DEPARTMENT A			
1.	21830	21235	594
2.	14410	17546	-3136
3.	19360	20052	- 692
4.	17760	20371	-2611
5.	12500	13886	-1386
6.	21800	27125	-5325

Total Female residuals = - $169,832 Average for 83 females = $ 2,046

plaintiffs will use testimony from witnesses and other qualitative evidence to substantiate this further extension.

At the completion of the presentation by the plaintiffs, the court retires to review the evidence and decide if a prima facie case has been established. The judge must ask himself if the evidence provided by the plaintiffs goes unexplained, is it not more likely that a discriminatory criterion has been inflicted upon women faculty members. If the answer is "yes", then the plaintiff has proven a prima facie case and the court turns to the defendant and essentially says, "The plaintiffs have raised some interesting questions which suggest a bias in your salary and promotion procedures. If you fail to rebut these inferences, we will accept the allegations as true" (Baldus and Cole, 1980). With this, the burden of proof is shifted to the institution.

Defense Against the Prima Facie Case

To an experienced analyst, the examples of prima facie exhibits given in the preceding section would be amusing were it not for the fact that they are considered acceptable evidence in a claim which has very serious intent. One might well wonder why it is so easy to establish a prima facie case. One reason, given by Baldus and Cole (1975), is that in discrimination cases the court prefers to quickly shift the burden of proof onto the shoulders of the institution in order to force it into bringing its salary and promotion policies out into the open. Generally the court will not be convinced by a defense that simply discredits the plaintiffs' statistics, models, and qualitative evidence. In addition to claiming that the plaintiffs omitted several important variables in their regression model or that their model was inappropriately constructed, the defense must go one large step further and demonstrate that if these same imperfections are corrected, the results disprove the claim of discrimination. A strong defense by the institution should consist of a comprehensive critique of each exhibit presented by the plaintiffs, followed by a new exhibit which

presents a totally different picture and which can withstand a similar review by the statistical expert representing the plaintiffs.

Before discussing the specifics of such a defense, a few reflections on more general matters are in order. A researcher accustomed to conducting a leisurely research project within the usual paradigm of a well designed, objective testing of a hypothesis will find that what is expected of him by the counsel for the defense is totally different. The institutional researcher must realize that the object of the courts in their review of quantitative evidence is not to develop a general theory of human behavior but merely to settle a dispute. The statistics are only part of the story, and the court looks to the law, its experience, and intuition to guide it in the resolution of the case (Baldus and Cole, 1980). The legal issues are paramount and the lawyers will direct the defense in such a manner as to ensure that the process does not bog down in a courtroom battle between statistical experts arguing arcane mathematical points which are completely irrelevant to the larger issues. If this point is kept constantly in mind, the institutional researcher will avoid the major problems and place the proper emphasis on dispatch, the degree of accuracy sufficient for the task, and simplicity.

In the process of refuting the credibility of the plaintiffs' exhibits, the institutional researcher must guard against developing a dangerous case of hubris. No one can produce a regression model of any complex process involving humans that will receive universal acceptance by other experts. One needs only to read a few of the many studies done on faculty salaries (see supplementary bibliography) to realize that every assumption, every causal inference, every statistical technique used in such a study will have its quota of expert detractors. The researcher is well served if he or she begins the task humbly, knowing in advance that the regression model he or she builds will fall short of the mark in the eyes of many experts. But this knowledge should not be

incapacitating because the intent is not to build the "perfect" model but rather to demonstrate that using the same data, another model can be constructed which produces a result contradictory to that obtained by the plaintiffs. If the institutional researcher can develop data and statistical models which at least negate, if not surpass in credibility, the corresponding exhibits entered by the claimants, the legal counsel for the institution should be able to organize the elements of testimony and qualitative evidence into a winning defense, assuming there is indeed a lack of class wide discrimination. Toward this end, the researcher must adopt an adversarial attitude; his function is not to engage in an open-minded research project but to gather together all evidence on certain questions that puts the institution to good advantage. This is not unethical; no one is asking that the researcher "create" data or knowingly use improper techniques; it is, however, not an open-minded inquiry either. In any case, if the researcher in the course of carrying out this task becomes enraptured with some aspect of theoretical esoterica, the lawyers can be counted upon to bring him or her back to earth in a not too gentle fashion. With these preliminaries attended to, we can now discuss the specific tasks that an institutional researcher may be asked to do.

An adequate refutation of the plaintiffs' first two exhibits showing the uneven distribution of women in the lower ranks and salary levels can probably be based entirely on simple demographic principles. This is familiar ground for most institutional researchers, and they would have no trouble in providing the lawyers with several strong arguments pivoting on the availability of qualified women, the effects of affirmative action legislation in overloading the entry level positions with women--some without the qualifications necessary for further advancement, and the phenomenon of women gravitating into certain disciplines that have a low economic market value. (See Bicket, Hammel, and O'Connell (1975) for some interesting insights into this.) If some of these points can be

supported by easily read data tables or graphs, so much the better. The court should be shown that by using extremely aggregated data for their exhibits (figure 1) the plaintiffs have presented a distorted picture. If one makes as simple a modification as stratifying the data by rank, in recognition of the fact that higher ranks pay better, a display such as shown in figure 3 will indicate that within the separate ranks, women seem to be paid nearly the same as their male counterparts. It may be possible to show that the difference is not statistically significant. An exhibit such as figure 4 could be used to demonstrate yet another problem associated with using such highly aggregated data, namely that women are clearly over-represented within the disciplines that are low paying because of soft demand. Further, the institutional researcher could provide a summary of a cohort study similar to that shown in Table 1, which gives corroborating evidence that women's salaries are comparable to males possessing roughly the same skills and experience. Since all of these displays are predicated upon the assumptions that women receive equitable treatment with respect to promotions, it is best to disarm a predictable attack on this issue by presenting additional arguments to support this assumption of fair promotion practices. Figures 5 and 6 are two such graphical examples. Legal counsel can restate the hypothesis that some minimally qualified females have recently been brought into the tenure system in a well intentioned but ill-advised effort to satisfy over zealous Health, Education and Welfare auditors. Lacking the required degree to advance further, such women remain in the lower ranks an inordinately long period and project the misconception that there is a promotional bias against women. A single table such as Exhibit 6 in Table 2 would lend much credence to this thesis and justify ignoring all faculty without the qualifying degree when constructing figures 5 and 6.

The direct refutation of the plaintiffs' regression exhibits should not be particularly difficult. Even a sound regression analysis offers an easy

Figure 3

Defense Exhibit 1

AVERAGE FACULTY SALARIES (10 MON. EQUATED)

BY SEX BY RANK

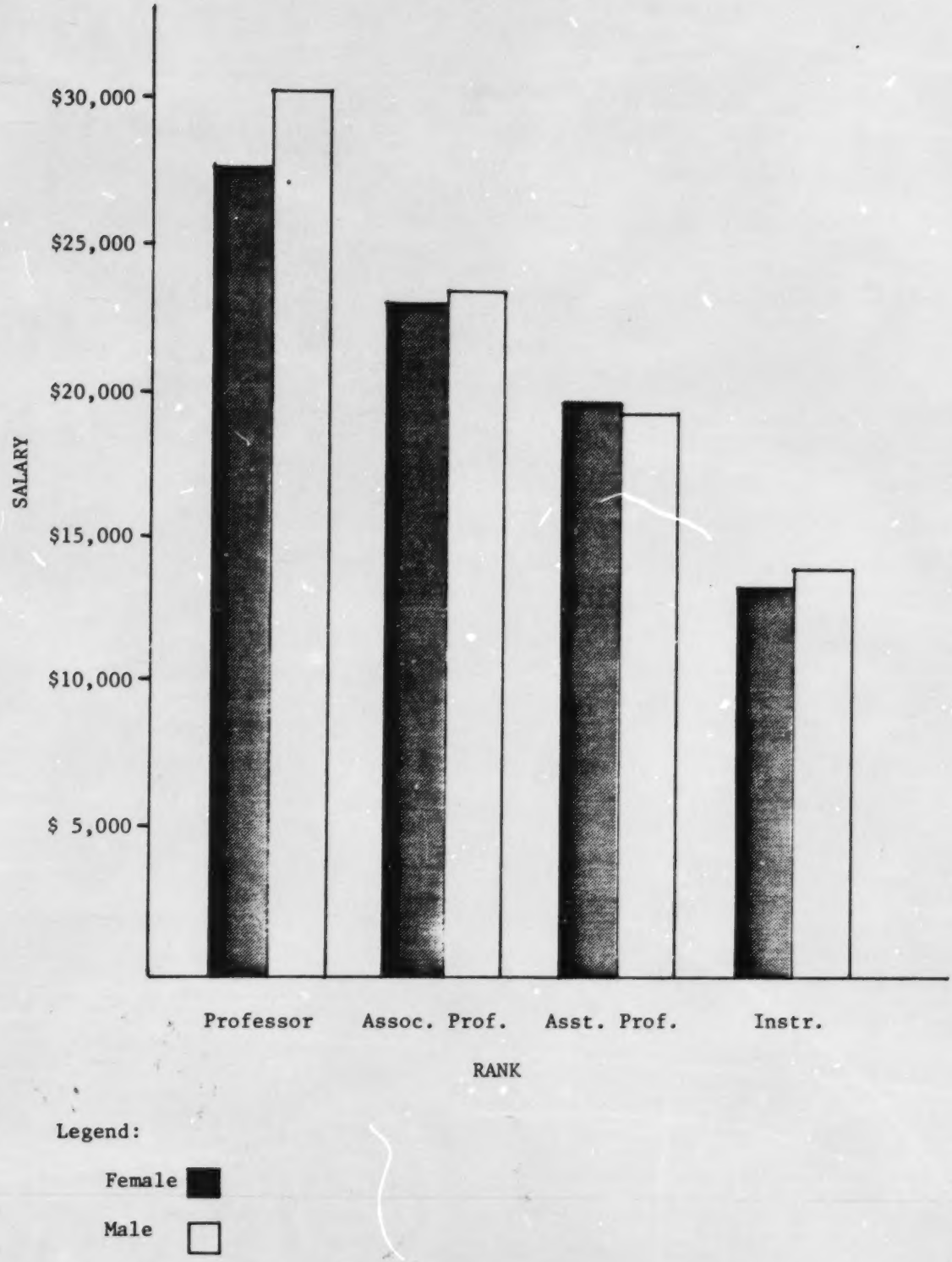


Figure 4

Defense Exhibit 2

DISTRIBUTION OF PROF. BY SEX ACROSS MEDIAN COLLEGE SALARY

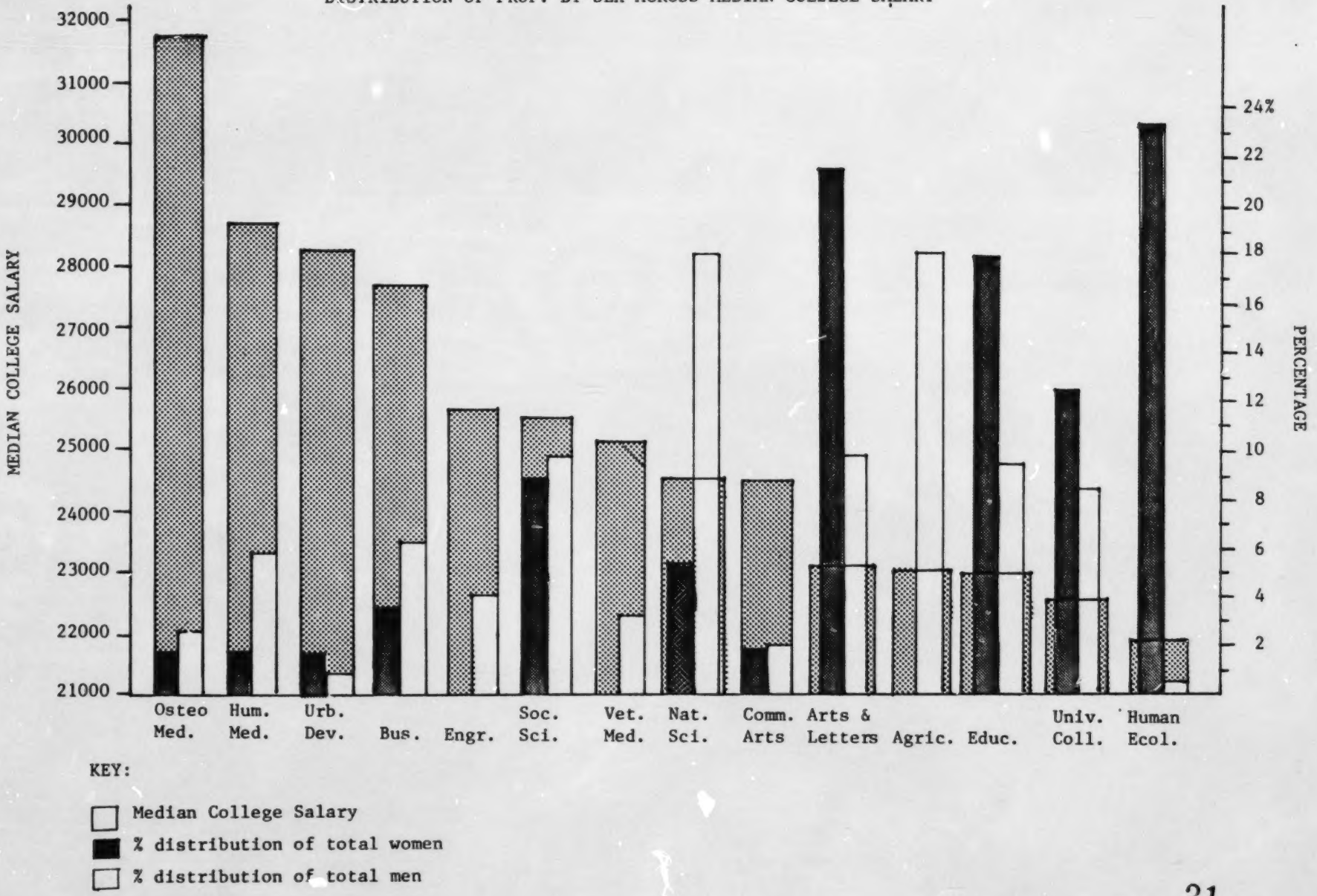


TABLE 1

Defense Exhibit 3

A COMPARISON OF THE SALARIES OF TENURE SYSTEM WOMEN FACULTY*

WITH OTHER SALARIES IN THEIR COHORT**

FALL, 1976

Women's Salaries

College	N Which Could be Compared	% Above Median: 8.1 or more	4.1 to 8.0	0.1 to 4.0	At Median	% Below Median: 0.1 to 4.0	4.1 to 8.0	8.1 or more	No Cohort
Agric. & NR	2	-	1	1	-	-	-	-	1
Arts & Let.	33	4	3	3	5	14	4	-	5
Business	2	1	-	1	-	-	-	-	-
Comm. Arts	6	-	-	-	1	1	2	2	-
Education	11	1	-	4	1	2	2	1	13
Human Ecol.	11	-	4	3	1	1	2	-	22
Human Med.	14	3	1	3	1	2	1	3	6
J. Morrill	-	-	-	-	-	-	-	-	1
L. Briggs	1	-	-	-	-	-	1	-	-
Natural Sci.	30	3	4	4	4	8	6	1	6
Osteo. Med.	10	1	1	4	1	1	-	2	2
Social Sci.	17	1	2	2	-	8	2	2	2
Univ. Coll.	38	1	3	7	10	15	2	-	1
Urban Devel.	-	-	-	-	1	-	-	-	-
Vet. Med.	2	-	-	1	-	-	-	1	2
TOTAL	178	15	19	33	25	52	22	12	61

* This study omits department chairpersons, assistant deans, Cooperative Extension faculty and faculty in central administration (Provost's and Vice Presidents' offices).

**A cohort consists of all faculty in a given college with the same:

1) rank
2) highest degree
3) months of employment
4) years at rank

Figure 5

Defense Exhibit 4

University (1972 - 80)

PROPORTION OF ASSISTANT PROFESSORS SERVING A GIVEN NUMBER OF YEARS IN RANK BEFORE PROMOTION

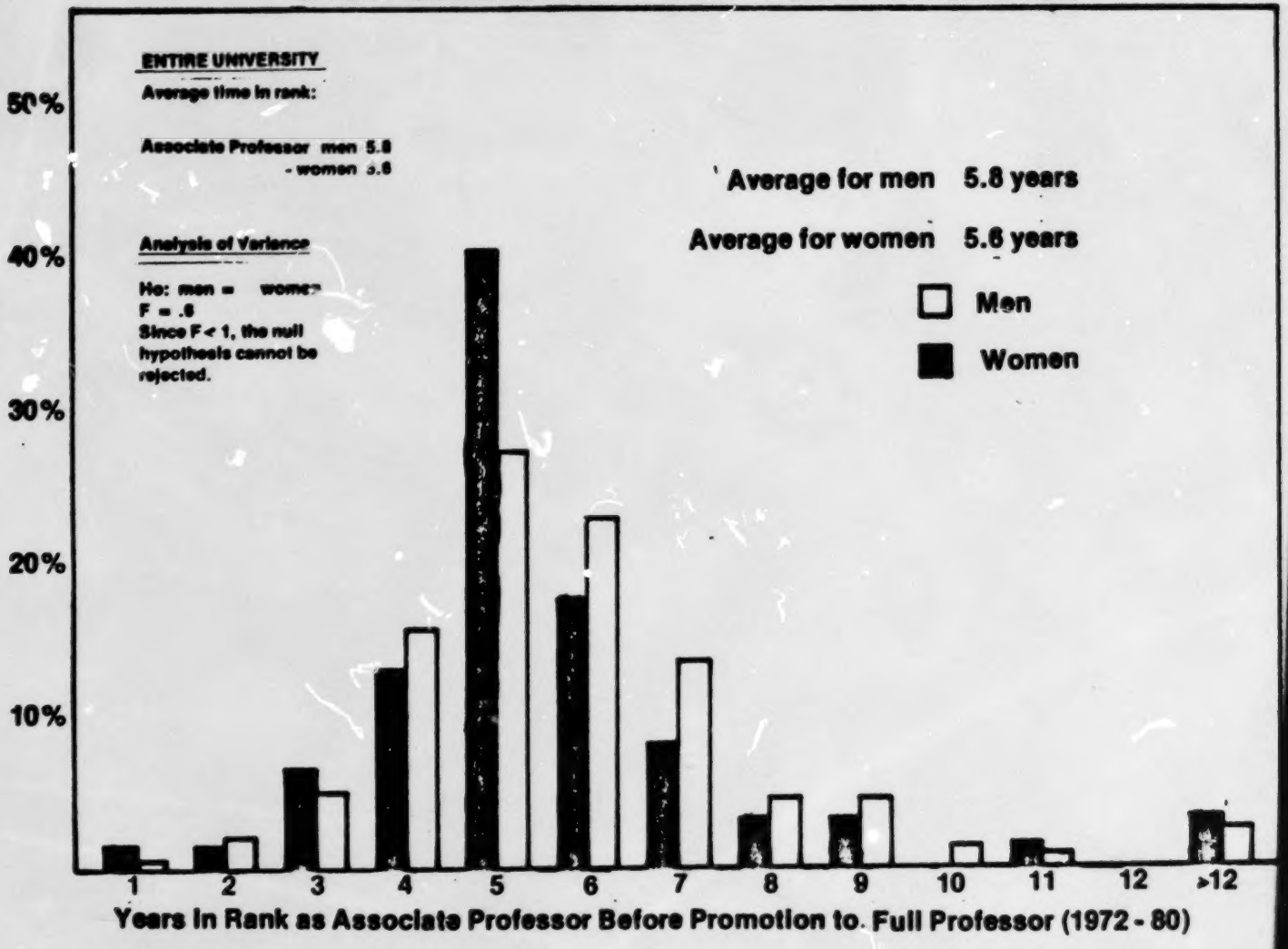


Figure 6
Defense Exhibit 5

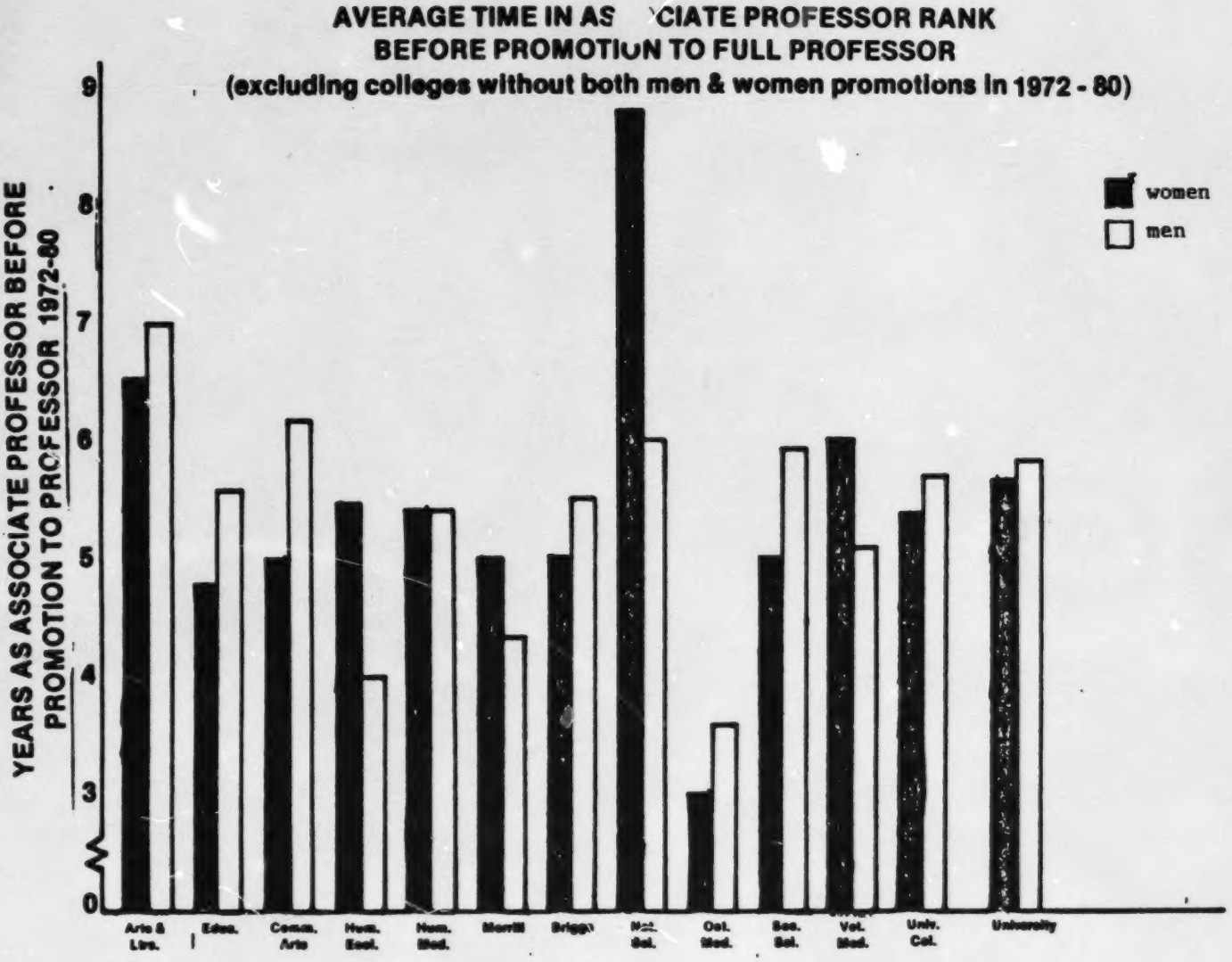


TABLE 2

Defense Exhibit 6

1976 TENURE SYSTEM FACULTY

	With Qualifying Terminal Degree	Without Qualifying Terminal Degree	(Percentage)
Men	1354	167	11.0%
Women	149	76	33.8%

target to a statistician who is familiar with the many technical and empirical arguments that are well documented in the literature (the bibliography provided would form a good starting point). If, in addition, the expert hired by the plaintiffs was unfamiliar with the byzantine style of university administration and the many problems associated with faculty personnel data, the institutional researcher will also have ample evidence of invalid data and assumptions. Exhibit 4 in Table 3 displays a regression equation that was received by the court as prima facie evidence in a sex discrimination case. To the experienced researcher, even a casual review will reveal such gross technical errors as the use of degree indicators as continuous variables. In this particular case, the plaintiffs did not have the time to handle the data on all faculty so they used a sample, which unfortunately for their argument, was not even a random sample, but rather what they termed a "judgment" sample. To discredit a flawed regression model such as this one, the defense does not have to introduce technical arguments; in fact, the lawyers would probably insist on limiting the points to those simple enough in concept to present in court--two of which would certainly be the absence of any proxy for merit or any disciplinary market indices.

Having successfully shown that the plaintiffs' regression model is replete with data errors, technical mistakes, and conceptional inadequacies that little, if any, weight can be attached to the results and the inferences drawn from them, the defense could conclude its quantitative arguments at this point; it would, however, be ill-advised to do so. In the process of advancing the argument that the plaintiffs' first two exhibits were invalid because the simple descriptive statistics did not take into account the other factors affecting faculty salaries, the defense implicitly established the need for a statistical procedure such as multi-variate regression which does meet this need. Further, it is quite likely that the court holds the expectation that the defense would exhibit a regression model that supports their case, for even though the lawyers

TABLE 3

Plaintiff Exhibit 4

REGRESSION MODEL OF FACULTY SALARIES

WITHIN SIX SELECTED UNITS

$$\text{Salary} = C_0 + C_1\ (\text{birth year}) + C_2\ (\text{degree} = \begin{cases} 1 \text{ if Ph.D.} \\ 2 \text{ if M.A.} \\ 3 \text{ if Professional} \\ 4 \text{ if Other} \end{cases})$$

$$+ C_3\ (\text{year of hire}) + C_4\ (\text{sex})$$

$$+ \underbrace{C_5\ (\text{dept 1}) + \ldots. + C_9\ (\text{dept 5})}_{\text{categorical variables for dept.}}$$

$r^2 =$ .55878

Std. Dev. $3,502.

for the institution manage to cast serious doubts on the validity of the plaintiffs' model, their attack focused on the data and variables used in the model and not on the concepts behind the regression process itself which remain solidly ensconced as an eminently reasonable and intuitively appealing means of explaining a complex process. There is a growing literature of courtroom use of regression models, and most of it suggests that no side of the contest has the luxury of sitting back and critiquing the other's models--an admittedly easy task. Most courts expect both antagonists to produce explanatory models. In some cases a pre-hearing protocol has been developed to specify those data variables which are relevant and important and to ensure that both sides begin with those data and incorporate other data variables on a separate basis only when necessary for purposes of accuracy or refinement. Such a protocol ensures that both sides start in agreement with the simplest possible model and then progress into more complex models containing elements about which there is contention. This type of protocol has worked successfully in proceedings before the Commodity Exchange Authority, Federal Power Commission, Civil Aeronautics Board, and Postal Rate Commission, to name a few where complex econometric regression models abound. Finkelstein (1973) succinctly expresses what has frequently been the courts' view on this matter: "In criticizing models it is possible to speculate endlessly that different data, forms of equation, or explanatory variables would yield significantly different and superior results. Compelling definite calculations will bring such easy speculation down to earth." He then goes on to cite the case of the Amerada Petroleum Corporation hearing before the Federal Power Commission where the expert for Amerada presented a regression model only to demonstrate that different techniques could yield different results, but did not claim that his model was the correct model. This, then, is essentially the strategy than an institution facing a class action suit might adopt to good advantage.

As a first step toward this end, the institutional researcher needs to take a very close look at his personnel data and use his intimate knowledge of data idiosyncracies--which always exist--to refine the data. For example, how is the "date of hire" handled when a faculty member works for the institution for ten years on a part time basis before going full time? Is there a separate data element for the date of entry into the tenure system? What happens if a faculty member leaves the institution for several years and then is re-employed; does the "date of hire" reflect this later entry? Such questions can be raised about nearly every data element and the resulting adjustments can have a material effect on the model.

We have found it necessary to create a new variable called the "qualifying degree". Specifying the type of degree (i.e., Ph.D., M.D., M.A., etc.) is not sufficient because what the researcher is really after is whether or not the faculty member possesses the degree that his peers deem to be necessary for promotion and full salary raises. In such fields as studio art, theater, music, social work, nursing, architecture, criminal science, a master's degree may be considered the qualifying degree. Other data elements that researchers have found to be useful in constructing salary models include: rank, full or academic year appointment, years with the institution, age, years experience, years in the tenure system, years in current rank, years since receiving the terminal degree, some proxies for merit such as articles published and grants received, type of degree, department, college, and tenure status. If the situation permits, the researcher may wish to eliminate certain classes of faculty who skew the data and are not germane to the case; such subgroups may include medical faculty; part-time, adjunct, visiting and emeritus faculty; non-instructional faculty in support units, ex-administrators; current administrators holding faculty rank--assistant, associate deans and chairmen. We have found that some relative index of the market value of a discipline to be useful. Such an

index can be formulated by using average department salaries by rank as compiled from data exchanged with peer institutions. In the absence of peer data, a more general index for the disciplines could be created by using the salary data completed by the National Association of Universities and Land Grant Colleges (1980). Even the dependent variable--salary--offers many possible expressions. A researcher may wish to use the actual salary, all salaries pro-rated to the academic year, the salary adjusted by using the discipline market value to remove the effects of the market, or the natural logarithm of any of these. By the above list of potential variables, we do not mean to imply that they all should be used in a given model, for clearly some of them are proxies for essentially the same quality and are thus highly correlated. Also, many of the variables expressed in "years" should be used in conjunction with their squared value so as to take into account the very common occurrence of diminishing salary increases over time.

Once the researcher has a complete and finely tuned data base, he or she must then grapple with questions which are of a far less well defined nature. What type of regression procedure should be used? stepwise? forward or backward? What significance levels should govern the inclusion and exclusion of variables? Here experience, trial and error, and published findings of others are all called upon. (See Pezzullo and Brittingham, 1979, and other papers listed in Supplementary References).

If the researcher has been successful in defending the thesis that women have not been discriminated against with respect to rank, then whether or not to include "rank" as a variable is no longer an issue. This is an important step because rank is by far the best "explainer" of salary, without which the model fits the data very poorly and causes nearly every variable to appear statistically significant even when intuition tells one that the results are nonsense.

In the course of trying out various models, the researcher may well end up with several significantly different regression models which meet certain criteria of acceptability. If the goodness of fit is attested to by an r^2 value somewhere between .75 and .95, the standard error is less than $3,000, and all the variables are statistically significant, the researcher probably has models that will hold up in court as being statistically sound. At this point, the investigator can pursue one of two fairly direct tactics. If one of the models involved a stepwise regression which at an intermediate stage dropped the gender variable out of the regression equation, this is the model that has the greatest potential in the courtroom. The ensuing argument is free of complexities and has great intuitive appeal, for if a statistical expert can appear in court with a defensible model which shows that gender has no statistically significant effect on salary, the premise of sex discrimination is probably laid to rest--at least with respect to quantitative argument. If several models accomplish this objective, select the simplest model even if it means giving up a few percentage points on the r^2. A simple model that relates salary to a few, intuitively sensible variables is, in the courtroom, far superior to one containing sixty highly contrived variables and bristling with logarithms and other mathematical ornaments.

If in every simple model tried, sex appears as a significant variable, this by no means implies that discrimination does exist. It does mean, however, that more complex models will have to be built. An experienced researcher might prefer to hold with a simple model that shows gender to be statistically significant and argue from the standpoint of practical significance. This strategy has its merits. Among social science researchers the statistical significance of a given variable is not the primary concern. In fact, hypothesis testing generally relegates significance to a secondary role and focuses instead on the Δr^2 brought about by the variable under question. As stated in McNeil, Kelly,

and McNeil (1975), "Statistical significance simply indicates that something other than chance is operating...but doesn't indicate to what degree. Research studies using extremely large sample sizes often do find statistical significance, but little practical significance is obtained." Thus, the researcher has solid backing if he wishes to take the tack that the statistical significance of "sex" is but an artifact of large sample size. If the regression coefficient on the sex variable and the Δr^2 attributed to it are both small, one can argue that little practical import can be assigned to gender. Although such an approach may carry weight in a seminar with other statistical analysts, there is an element of risk attached to attempting to carry it out within the courtroom. The lawyer representing the plaintiffs can seize upon the admission that "sex" is statistically significant and by constant repetition of that theme completely overwhelm a defense that is trying to explain certain niceties of statistical theory. Many lawyers would advise against a defense which rests on showing that the discrimination amounts to only $100 for each woman. The amount may be judged immaterial if the institution is willing to admit to a systematic bias against women. Baldus and Cole (1980) seem to attach considerable importance to the concept of statistical significance in establishing proof of discrimination.

Thus, if the simpler models are incapable of showing sex to have an insignificant effect on salaries, the researcher may wish to try more complex models. Before doing so, one may wish to experiment with reducing the data set by eliminating all faculty who belong to a department having no women faculty. This would remove the possible effects of extrapolating a linear model into areas of sparse data (see McCable, 1979). The researcher may also trying running a separate model for each faculty rank.

If these further trials are fruitless, an institutional researcher can then explore the tactic of showing that if there is any discrimination within

the university, it can be isolated within certain departments. The acceptance of this thesis would essentially reduce the class from all women faculty members to the class consisting of women in a few departments. See Rosenthal, Simpson, and Sperber (1981) for an example.

There is a final exhibit, which may be used alone or supplementary to showing gender to be non-significant in one of the above described models.

This exhibit would correspond to the plaintiffs' exhibit, figure 2, which plotted male and female salary residuals. A more convincing and condensed exhibit can be presented by constructing separate frequency distributions for the salary residuals of men and women. If there is little or no significant bias in the system, the visual similarity of the two distributions would speak for itself. Such a demonstration appears in figure 7. There is some controversy as to how one should obtain these residuals. Scott (1977) maintains that the model should first be developed using only the data for male faculty and then the residuals calculated by running all data, for both males and females, through the model. McCabe (1979) contests the validity of this approach on the basis of improper extrapolation. It is our experience that for the purpose of constructing a frequency distribution, the differences between these two approaches is undetectable to the eye and not important enough to debate.

We conclude with a short list of recommendations.

Recommendations

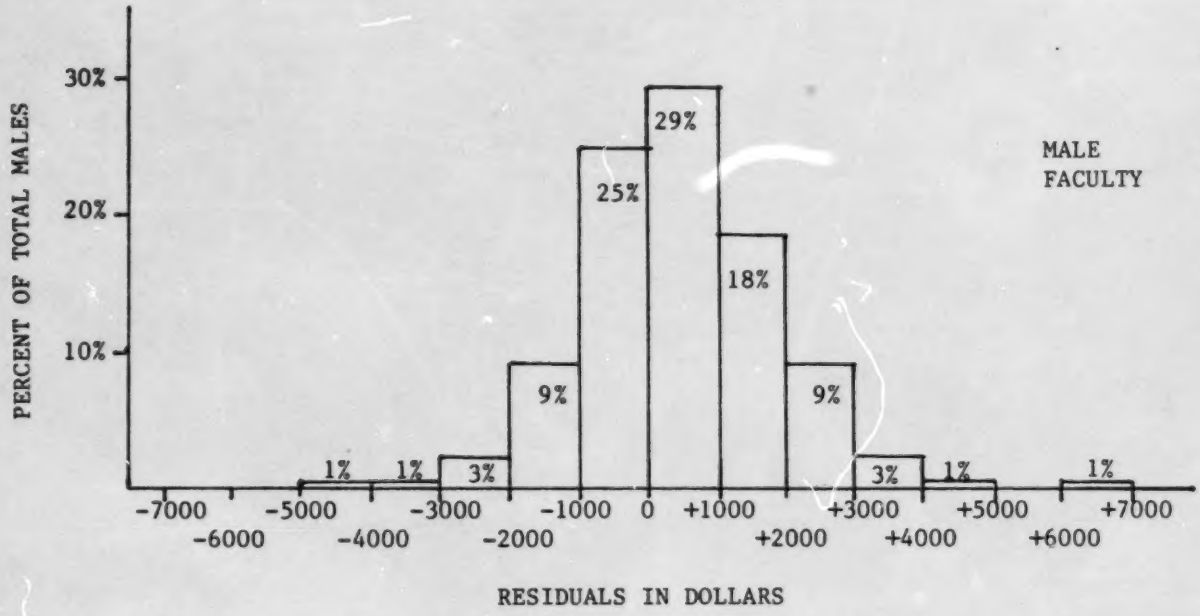
1. The institutional researcher is well advised to assume that a class action suit lays in the future. If he/she has never performed any regression analyses of salaries, the referenced papers should at least be read and every effort made to gain some first hand experience in conducting such a study. A class action suit does not provide the proper learning environment. Preliminary experiments will quickly reveal inadequacies in the data base and give the researcher time to fill in the gaps in advance of need.

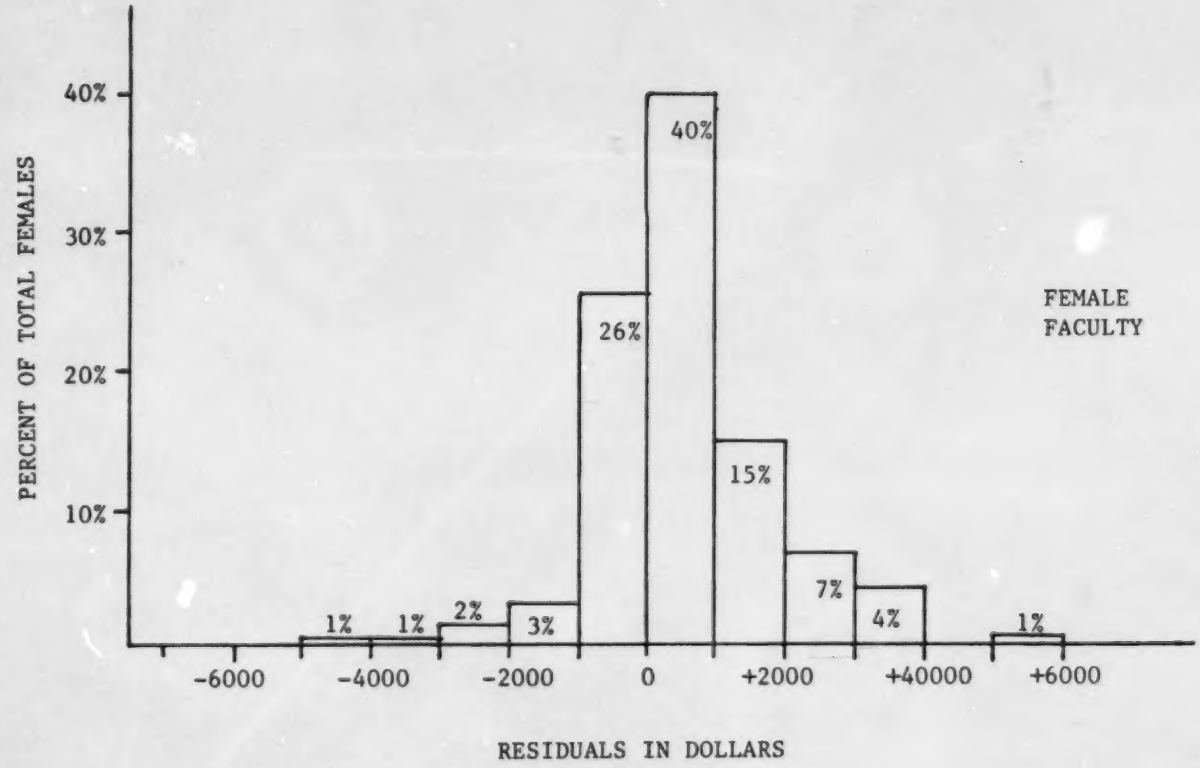
Figure 7

Defense Exhibit 7

FREQUENCY DISTRIBUTION OF FACULTY SALARY RESIDUALS

(PREDICTED - ACTUAL SALARY)





2. In addition to regression studies, the researcher should ensure that other institutional studies are on hand for immediate reference. Various tabulations of faculty according to rank, degree, time in rank, raises awarded, experience, etc., are often very useful. A cohort study that matches salaries for women with those of their male peers is another potentially important investigation. Rarely does time permit the researcher to develop this type of material once the class certification begins.

3. Once the institutional researcher becomes actively engaged in providing quantitative data to the lawyers, it is easy to lose perspective. If possible, one should attempt to retain a balanced overview by remembering:

(1) The legal issues far outweigh the statistical issues. Intuition and judgment will usually resolve those points where contradictory statistical theories intersect.

(2) Visual impact is important. Graphs convey a far more convincing and easily remembered image than tabular data.

(3) Certain phrases such as "statistically significant" carry far more weight with a lay audience in court than they may be accorded by a statistican. Use them with great care.

(4) The primary function of the quantitative evidence is to demonstrate that a different approach or more sophisticated model can result in outcomes that contradict and thus neutralize the plaintiffs' exhibits.

4. The class certification may well pivot on how well the lawyers for the defense are able to demonstrate that the departments have complete autonomy with respect to salary and promotion decisions. An alert institutional researcher would review the institution's by-laws, records, and procedures to see if there are any potential contradictions to such a claim. If deans and central administrators seem to overrule department decisions with any sort of regularity, the

responsible administrators should be warned of the possible consequences.

5. Since merit should have a strong influence on salaries and yet is nearly impossible to capture in a regression model, the institution needs to carefully document in writing the circumstances surrounding any selective raises given on merit.

6. Institutions should refrain from placing individuals into the tenure system before they possess the minimum credentials necessary for further advancement. Failing this, the researcher must handle certain data variables very carefully in a regression model. "Time in rank" can not be used without regard for whether the individual held a terminal degree for the entire period.

7. The lawyers handling the defense for the institution will probably decide to hire an outside statistical expert to present the regression analysis in court. Such an expert would appear to be less biased than a university employee, he/she would probably have some experience in making such courtroom presentations, and his testimony would serve to counter the impression made by the plaintiffs' expert. The hiring of such an outside consultant may not alter the workload placed on the institutional researcher because of the late date at which he is brought into the case. There is a reason for this. Knowing that the outside expert will be subjected to intense cross examination, the lawyers usually prefer that he knows little more than that on which he is expected to testify. Thus, the institutional researcher is cast in the role of developing a satisfactory model and explaining it to the expert. Usually the consultant will request a few other regression runs be made to check out some ideas of his own, but generally he will be satisfied if the model presented to him is reasonable and meets the usual criteria of acceptability.

8. If any reference can be singled out as providing the best assortment of examples and alternative approaches to defending against the class discrimination suit, the authors would select the Baldus and Cole (1980) reference.

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